SECTION 6100 - BLASTING

6101 GENERAL.

A. Blasting will be permitted. Blasting shall be done only by people experienced in the handling of explosives, and in accordance with the recommendations of the AGC Manual of Accident Prevention in Construction and OSHA regulations. In locations where flying rock may be present, additional overburden shall be ready for use and/or in place before denotation. All trenching operations utilizing explosives shall be suitably backfilled to prevent any fly rock endangerment to persons or property. The use of these procedures does not relieve the contractor of responsibility for damage to life and property but acts only as an added assurance to the owner that damage will not occur.

B. The Gardner Public Safety Department will be known as the "authority having jurisdiction" regarding the storage, handling, use and control of explosives used in construction projects. All permits for this use will be issued by the Public Safety Department. Control of the right-of-way remains with the Engineering Division.

Requirements of the International Fire Code regarding explosives and blasting agents shall be considered part of these specifications. All explosives and related material shall be in conformity with the requirements of the authority having jurisdiction, and the specifications contained herewith, whichever is more stringent. Blasting will not be permitted within eighty feet (80') of any building structure.

All blasting operations shall be conducted under the direction of a Kansas certified blaster. Certificates of blaster certification shall be carried by blasters or shall be on file at the Public Safety Department during blasting operations. A blaster and at least one other person shall be present at the firing of a blast. Persons responsible for blasting operations at a blasting site shall, as a minimum, conform to the criteria as outlined.

The contractor shall be responsible for all damage caused by his blasting operations and shall be responsible for responding to all complaints. Suitable methods shall be employed to confine all materials lifted by blasting within the limits of the excavation or trench. All rock which cannot be handled and compacted as earth shall be kept separate from other excavated materials and shall not be mixed with backfill or embankment materials except as specified or directed

All blasting by the contractor and his subcontractors shall be in conformity with the requirements having jurisdiction over the right-of-way, or the specifications contained herewith, under the International Fire Code and Public Safety Department, whichever is more stringent.

The blast design shall be submitted to the Public Safety Department for review prior to any blasting operations. The blast design shall contain sketches of the drill patterns, delay periods, and decking and shall indicate the type and amount of explosives to be used, critical dimensions, and the location and general description of structures to be protected, as well as a discussion of design factors to be used, which protect the public and meet the applicable airblast and ground vibration standards. The blast design shall be prepared and signed by a certified blaster. The Public Safety Department shall may request changes to the design submitted.

6102 PREBLASTING SURVEY. At least 30 days before initiation of blasting, the surveyor shall notify, in writing, all residents or owners of dwellings or other structures located within 600 feet of the blasting area of the intent to conduct a preblasting survey. The Pubic Safety Department may identify alternate preblast survey distances.

The surveyor shall promptly conduct a preblasting survey of the dwellings or structures and promptly prepare a written report of the survey. An updated survey of any additions, modifications, or renovations shall be performed by the surveyor if requested by the contractor or Pubic Safety Department.

The surveyor shall determine the condition of the dwelling or structure and shall document any existing damage and other physical factors that could reasonably be affected by the blasting. The surveyor shall examine the interior as well as the exterior structure and shall document any damage by means of photographic or video cassette methods. Structures such as pipelines, cables, transmission lines, cisterns, wells, and other water systems warrant special attention; however, the assessment of these structures may be limited to surface conditions and other readily available data. The interior of the existing sanitary sewer shall be surveyed by means of a permanently recorded closed circuit video camera prior to blasting operations and after blasting has been concluded in the area of the existing sewer.

The written report of the survey shall be signed by the person who conducted the survey. Copies of the report shall be promptly provided to the contractor and to the Pubic Safety Department. All surveys shall be completed by the surveyor before the initiation of blasting. All surveys shall be conducted by a disinterested third party, regularly engaged in performing preblast surveys.

The contractor shall submit with the bid, a detailed preblast survey method to be reviewed by the Pubic Safety Department. The preblast survey shall not commence until the survey method has been reviewed by the Pubic Safety Department for completeness.

6103 PUBLIC NOTIFICATION. Before blasting is started, the contractor shall inform all residents within a radius of 1500 feet of the blasting location by means of printed information sheets.

6104 WARNING SYSTEM. The contractor shall provide suitable warning by siren or whistle prior to all blasts.

6105 OVER-BLASTING. The requirements presented herein shall not relieve the contractor from responsibility to avoid disturbing earth or rock beyond indicated and specified lines and levels.

6106 NOTIFICATION. The contractor shall notify the owner of all gas, water, and petroleum pipe lines in any area where blasting will be utilized. A representative of the pipeline owner shall be allowed to be present to observe preparations and blasting.

6107 TECHNICAL ASSISTANCE. When necessary, the Pubic Safety Department can render technical assistance in controlling ground vibration and fly rock at the request of the blaster and/or the Engineering Division.

6108 BLASTING SCHEDULE. The contractor shall conduct blasting operations at times approved by the Pubic Safety Department and engineer, and announced in the blasting schedule.

All blasting shall be conducted between 8:30 a.m. and 4:30 p.m. The Pubic Safety Department or engineer may specify more restrictive time periods for blasting.

6109 BLASTING SIGNS, WARNINGS, AND ACCESS CONTROL. Blasting signs shall meet the specifications of this section. The contractor shall:

A. Conspicuously place signs reading *Blasting Area* along the edge of any blasting area that comes within 100 feet of any public road right-of-way, and at the point where any other road provides access to the blasting area; also, conspicuously place signs reading *Blasting Area - Turn Off Two-Way Radios* along the edge of any blasting area that comes within 500 feet of any public road right-of-way and 1000 feet on either end of the blasting area; and

B. At all entrances to the permit area from public roads or highways, place conspicuous signs which state *Warning! Explosives In Use,* which clearly list and describe the meaning of the audible blast warning and all-clear signals that are in use, and which explain the marking of blasting areas and charged holes awaiting firing within the permit area.

Warnings and all-clear signals of different character or pattern that are audible within a range of 1000 feet from the point of the blast shall be given. Each person within the permit area and each person who resides or regularly works within 1000 feet of the permit area shall be notified of the meaning of the signals.

Access within the blasting area shall be controlled to prevent presence of livestock or unauthorized persons during blasting and until an authorized representative of the contractor has reasonably determined that no unusual hazards, such as imminent slides or un-detonated charges, exist; and access to and travel within the blasting area can be safely resumed.

6110 CONTROL OF ADVERSE EFFECTS. Blasting shall be conducted to prevent injury to persons, damage to public or private property outside the permit area, adverse impacts on any underground mine, and change in the course, channel, or availability of surface or ground water outside the permit area.

A. Airblast. Airblast shall not exceed the maximum limits listed on the next page at the location of any dwelling, public building, school, church, or community or institutional building outside the permit area, except as provided in this section.

Lower frequency limit of measuring system, in Hz (+3 dB)	Maximum level, in dB
0.1 Hz or lower--flat response[1]	134 peak.
2 Hz or lower--flat response	133 peak.
6 Hz or lower--flat response	129 peak.
C-weighted--slow response[1]	105 peak dBC.

[1] Only when approved by the Pubic Safety Department.

If necessary to prevent damage, the Pubic Safety Department or engineer can specify lower maximum allowable airblast levels than those of listed in this section for use in the vicinity of a specific blasting operation.

The contractor shall conduct periodic monitoring to ensure compliance with the airblast standards. The measuring systems shall have an upper-end flat frequency response of at least 200 Hz.

B. Ground Vibration. The maximum ground vibration for protected structures listed in this section shall be established in accordance with either the maximum peak-particle-velocity limits, the scaled-distance equation, the blasting level chart , or by the Pubic Safety Department. All structures in the vicinity of the blasting area, such as water towers, pipelines and other utilities, tunnels, dams, impoundments, and underground mines, shall be protected from damage by establishment of a maximum allowable limit on the ground vibration, 1.0 inches per second, the Pubic Safety Department may specify a more restrictive limit in the interest of the public safety, or the Pubic Safety Department may approve a higher limit if justified by the contractor.

The maximum ground vibration shall not exceed the following limits at the location of any dwelling, public building, school, church, or community or institutional building outside the permit area.

	MAXIMUM	
	ALLOWABLE	SCALED PEAK
Distance (D) from the blasting site in feet.	Particle velocity (Vmax) for ground vibration in inches/second[1]	Factor to be applied without seismic monitoring[2]
0 to 300	1.00	50
301 to 5,000	1.00	55
5,001 and beyond	0.75	6

[1] Ground vibration shall be measured as the particle velocity. Particle velocity shall be recored in three mutually perpendicular directions. The maximum allowable peak particle velocity shall apply to each of the three measurements.

[2]Applicable to the scaled-distance equation.

A seismographic record shall be provided for each blast.

A contractor may use the scaled-distance equation, W=(D/Ds), to determine the allowable charge weight of explosives to be detonated in any 8-millisecond period, without seismic monitoring; where W=the maximum weight of explosives, in pounds; D=the distance, in feet, from the blasting site to the nearest protected structure; and Ds=the scaled-distance factor, which may initially be approved by the engineer using the values for scaled-distance factor listed.

The contractor may use the ground-vibration limits in Figure 1 this section to determine the maximum allowable ground vibration.

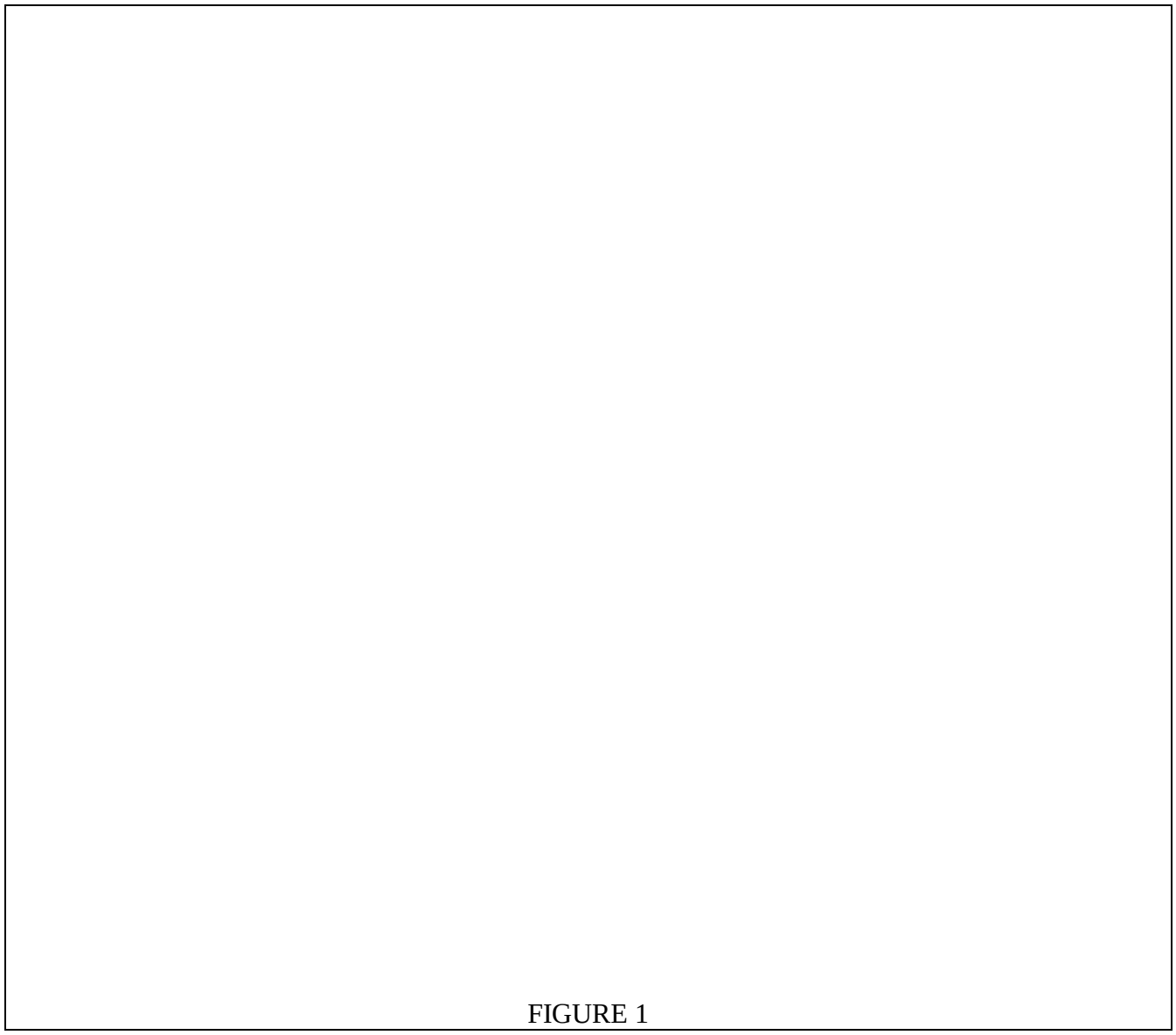

FIGURE 1

If the Figure 1 limits are used, a seismographic record including both particle velocity and vibration-frequency levels shall be provided for each blast. The method for the analysis of the predominant frequency contained in the blasting records shall be approved by the Pubic Safety Department before application of this alternative blasting criterion.

The maximum allowable ground vibration can be reduced by the Pubic Safety Department beyond the limits otherwise provided by this section, if determined necessary to provide damage protection.

The contractor shall conduct seismic monitoring of all blasts.

6111 RECORDS OF BLASTING OPERATIONS. The contractor shall retain a record of all blasts for at least three (3) years. Upon request, copies of these records shall be made available to the engineer and to the public for inspection. Such records shall contain the following data:

A. Name of the contractor conducting the blast.
B. Location, date, and time of the blast.
C. Name, signature, and certification number of the blaster conducting the blast.
D. Identification, direction, and distance, in feet, from the nearest blast hole to the nearest dwelling, public building, school, church, community or institutional building outside the permit area, except those described herein.
E. Whether conditions, including those which may cause possible adverse blasting effects.
F. Type of material blasted.
G. Sketches of the blast pattern including number of holes, burden, spacing, decks, and delay pattern.
H. Diameter and depth of holes.
I. Types of explosives used.
J. Total weight of explosives used per hole.
K. The maximum weight of explosives detonated in an 8-millisecond period.
L. Initiation system.
M. Type and length of stemming.
N. Mats or other protections used.
O. Seismographic and airblast records, shall include:
    1. Type of instrument, sensitivity, and calibration signal or certification of annual calibration;
    2. Exact location of instrument and the date, time and distance from the blast;
    3. Name of the person and firm taking the reading;
    4. Name of the person and firm analyzing the seismographic record; and
    5. The vibration and/or airblast level recorded.

6112 BLASTER. The blaster shall be trained and be knowledgeable in the applications of all section.

The blaster shall be responsible for:

A. Explosives, including
    1. Selection of the type of explosive to be used;
    2. Determination of the properties of explosives which will produce desired results at an acceptable level of risk; and
    3. Handling, transportation, and storage;
B. Blast designs, including
    1. Geologic and topographic considerations;
    2. Design of a blast hole, with critical dimensions;
    3. Pattern design, field layout, and timing of blast holes; and
    4. Field applications;
C. Loading blastholes, including priming and boostering;
D. Initiation systems and blasting machines;

E. Blasting vibrations, airblast, and flyrock, including
    1. Monitoring techniques, and
    2. Methods to control adverse effects;
F. Secondary blasting applications;
G. Current federal and state rules applicable to the use of explosives;
H. Blast records;
I. Schedules;
J. Preblasting surveys, including
    1. Availability
    2. Coverage, and
    3. Use of in blast design;
K. Blast-plan requirements
L. Certification and training;
M. Signs, warning signals, and site control
N. Unpredictable hazards, including
    1. Lightning,
    2. Stray currents,
    3. Radio waves, and
    4. Misfires

The blaster shall be licensed by the appropriate licensing authority. The blaster shall be responsible for obtaining all necessary permits required for blasting operations.